

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1. (previously presented) An arrangement for cooling an electronic assembly, the arrangement comprising:

a circuit board having a first surface, a second surface, and at least a first heat-generating element secured to the first surface, the circuit board further comprising at least one aperture extending between the first surface and the second surface;

an enclosure member secured to said circuit board so as to form a fluid tight barrier of a compartment defined at least in part by said enclosure member, said compartment including a first subcompartment defined at least in part by said first surface and said enclosure member and a second subcompartment defined at least in part by said second surface and said enclosure member; and

at least one electromechanical actuator secured within the compartment, at least a portion of the at least one electromechanical actuator disposed over the at least one aperture, the electromechanical actuator operable to generate a flow movement in the direction of the at least one aperture when liquid is disposed in the compartment.

Claim 2. (original) The apparatus of claim 1 further comprising a liquid disposed within the compartment.

Claim 3. (original) The apparatus of claim 1 wherein the circuit board includes a top end portion and a bottom end portion, and wherein the top end portion includes at least one aperture extending between the first surface and the second surface.

Claim 4. (original) The apparatus of claim 1 wherein the at least one mechanical actuator includes a piezoelectric actuator.

Claim 5. (original) The apparatus of claim 4 wherein the at least one mechanical actuator further includes a substantially rigid blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

Claim 6. (original) The apparatus of claim 5 wherein the piezoelectric actuator is secured within the first subcompartment proximate the at least one aperture and the substantially rigid blade extends from the piezoelectric actuator in the direction of the at least one aperture, and wherein the apparatus further comprises a flapper valve having a first end secured within the second subcompartment proximate the at least one aperture and a second end movably coupled to the first end, the second end movable to alternately allow fluid flow through the first aperture and inhibit fluid flow through the first aperture.

Claim 7. (original) The apparatus of claim 4 wherein the at least one mechanical actuator further includes a flexible blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

Claim 8. (original) The apparatus of claim 7 wherein the flexible blade extends in the first direction from the piezoelectric actuator, said first direction having an axial component with respect to the at least one aperture.

Claim 9. (original) The apparatus of claim 7 wherein:
the circuit board includes a top end portion and a bottom end portion;
the top end portion includes at least one aperture extending between the first surface and the second surface; and the piezoelectric actuator is secured within the first subcompartment below the at least one aperture and the flexible blade extends in the first direction toward the top end portion.

Claim 10. (original) The apparatus of claim 1 wherein the enclosure includes a plurality of cooling fins configured to convey heat from a fluid disposed within the compartment to an external environment.

Claims 11-16 (canceled)

Claim 17. (withdrawn) The method of claim 11 wherein step b) further comprises employing the electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture, wherein the electromechanical actuator includes a piezoelectric actuator and a flexible blade having a first end coupled to the piezoelectric actuator and a second end extending in a first direction from the first end.

Claim 18. (currently amended) An arrangement for cooling an electronic assembly, the arrangement comprising:

a circuit board having a first surface, a second surface, and at least a first heat-generating element secured to the first surface, the circuit board further comprising at least one aperture extending between the first surface and the second surface;

an enclosure member secured to said circuit board so as to form a fluid tight barrier of a compartment defined at least in part by said enclosure member and said circuit board, said compartment including a first subcompartment defined at least in part by said first surface and said enclosure member and a second subcompartment defined at least in part by said second surface and said enclosure member;

a liquid disposed within said compartment; ~~and~~

at least one electromechanical actuator secured within the compartment, the electromechanical actuator operable to generate a flow movement of the liquid in the direction of the at least one aperture, the at least one mechanical actuator including a substantially rigid blade coupled to a piezoelectric actuator and extending in a first direction from the piezoelectric actuator, the piezoelectric actuator coupled proximate the at least one aperture; and

a flapper valve having a first end secured within the second subcompartment proximate the at least one aperture and a second end movably coupled to the first end, the second end movable to alternately allow fluid flow through the first aperture and inhibit fluid flow through the first aperture.

Claim 19. (original) The arrangement of claim 18 wherein the circuit board includes an external portion that extends outward of the compartment.

Claim 20. (previously presented) The apparatus of claim 18 wherein the circuit board includes a top end portion and a bottom end portion, and wherein the top end portion includes at least one aperture extending between the first surface and the second surface and the bottom end portion.

Claims 21-23. (canceled)

Claim 24. (withdrawn) The apparatus of claim 21 wherein the at least one mechanical actuator further includes a flexible blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

Claim 25. (withdrawn) The apparatus of claim 24 wherein the flexible blade extends in the first direction from the piezoelectric actuator, said first direction having an axial component with respect to the at least one aperture.

Claim 26. (withdrawn) The apparatus of claim 24 wherein:

the circuit board includes a top end portion and a bottom end portion;

the top end portion includes at least one aperture extending between the first surface and the second surface; and the piezoelectric actuator is secured within the first subcompartment below the at least one aperture and the flexible blade extends in the first direction toward the top end portion.

Claim 27. (withdrawn) The apparatus of claim 18 wherein the enclosure includes a plurality of cooling fins configured to convey heat from a fluid disposed within the compartment to an external environment.